

THEREFORE, WE CLAIM:

1. A crosslinking agent comprising an ungelled reaction product of the following reactants:

- 5 (A) at least one aminoplast resin;  
(B) a reactive urethane group-containing adduct which is a reaction product of the following reactants:

- (1) at least one mono-isocyanate; and  
(2) at least one polyfunctional polymer having functional  
10 groups reactive with the mono-isocyanate (1); and  
(C) at least one compound different from (B) having active hydrogen groups reactive with aminoplast resin (A), said compound selected from at least one of:

- (i) compounds having the following structure (I):



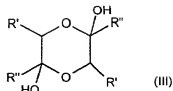
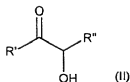
(I)

15 wherein X is aromatic; R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> can be the same or different and each independently represents H, (cyclo)alkyl having from 1 to 12 carbon atoms, aryl, alkaryl, aralkyl, or an active hydrogen-containing group,

20 provided that at least one of R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> represents an active hydrogen-containing group which is reactive with the aminoplast resin (A);

- (ii) compounds having the following structure (II) or (III):

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where R' and R'' are the same or different and each independently represents an aromatic group or an alkyl group having 1 to 12 carbon atoms; and

5 (iii) compounds different from (i) and (ii) and having a melting point of at least 80°C, wherein said crosslinking agent is essentially free of urethane NH functionality and has a glass transition temperature of at least 25°C.

10 2. The crosslinking agent of claim 1, wherein the aminoplast resin (A) is or is derived from at least one of glycoluril, aminotriazine and benzoguanamine.

3. The crosslinking agent of claim 2, wherein the aminoplast resin (A) 15 comprises alkoxyated aldehyde condensate of glycoluril.

4. The crosslinking agent of claim 3, wherein the aminoplast resin (A) comprises tetramethoxy methylglycoluril.

20 5. The crosslinking agent of claim 2, wherein the aminoplast resin (A) comprises (alkoxyalkyl) aminotriazine having one or less non-alkylated NH bond per triazine ring.

25 6. The crosslinking agent of claim 5, wherein the aminoplast resin (A) comprises (methoxymethyl) aminotriazine.

7. The crosslinking agent of claim 5, wherein the (alkoxyalkyl) aminotriazine has a degree of polymerization of 1.75 or less.
8. The crosslinking agent of claim 1, wherein the polyfunctional polymer (2) is selected from acrylic polymers, polyester polymers, polyether polymers, and mixtures thereof.
9. The crosslinking agent of claim 1, wherein the polyfunctional polymer (2) comprises functional groups selected from hydroxyl groups, amine groups, thiol groups, and combinations thereof.
10. The crosslinking agent of claim 1, wherein the polyfunctional polymer (2) comprises a polyester polymer having hydroxyl functional groups.
11. The crosslinking agent of claim 10, wherein the polyester polymer comprises a condensation reaction product of the following reactants:
- (A) a cycloaliphatic polyol; and
  - (B) a cyclic polycarboxylic acid or anhydride.
12. The crosslinking agent of claim 11, wherein the cycloaliphatic polyol (A) comprises a diol selected from hydrogenated Bisphenol A, cyclohexane dimethanol and mixtures thereof.
13. The crosslinking agent of claim 11, wherein the cycloaliphatic polyol (A) comprises hydrogenated Bisphenol A.
14. The crosslinking agent of claim 11, wherein the cyclic polycarboxylic acid (B) is selected from hexahydrophthalic acid, phthalic acid, isophthalic acid, terephthalic acid, anhydrides thereof, and mixtures thereof.

15. The crosslinking agent of claim 14, wherein the cyclic polycarboxylic acid (B) comprises hexahydrophthalic anhydride.
16. The crosslinking agent of claim 11, wherein the number average  
5 molecular weight of the polyester polymer ranges from 400 to 1500.
17. The crosslinking agent of claim 10, wherein the hydroxyl value of the polyester polymer ranges from 90 to 180.
- 10 18. The crosslinking agent of claim 1, wherein the glass transition temperature of the polyfunctional polymer (2) is at least 15°C.
19. The crosslinking agent of claim 1, wherein the glass transition  
temperature of the polyfunctional polymer (2) ranges from 40°C to 120°C.
- 15 20. The crosslinking agent of claim 1, wherein the mono-isocyanate (1) is selected from cyclohexyl isocyanate, phenyl isocyanate, butyl isocyanate and mixtures thereof.
- 20 21. The crosslinking agent of claim 20, wherein the mono-isocyanate (1) comprises cyclohexyl isocyanate.
22. The crosslinking agent of claim 1, wherein the molar ratio of the  
polyfunctional polymer (2) to the mono-isocyanate (1) ranges from 1:1.8 to  
25 2.0.
23. The crosslinking agent of claim 1, wherein the compound (C) comprises at least one compound having the structure (I).

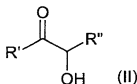
24. The crosslinking agent of claim 23, wherein at least one of  $R^1$ ,  $R^2$ , and  $R^3$  represents a group comprising an active hydrogen-containing group selected from hydroxyl, amide, amine, carboxylic acid, carbamate, urea, thiol and mixtures thereof.

25. The crosslinking agent of claim 24, wherein at least one of  $R^1$ ,  $R^2$ , and  $R^3$  represents a group comprising at least one hydroxyl group.

26. The crosslinking agent of claim 25, wherein the compound (C) comprises benzyl alcohol.

27. The crosslinking agent of claim 1, wherein the compound (C) comprises at least one of compound (C)(i).

28. The crosslinking agent of claim 27, wherein the compound (C) comprises a hydroxyl functional group-containing compound having the following structure (II):



or dimer derivatives thereof, wherein  $R'$  and  $R''$  are the same or different and each independently represents an (cyclo)alkyl group having 1 to 12 carbon atoms or an aromatic group.

29. The crosslinking agent of claim 28, wherein one or both of  $R'$  and  $R''$  represent aromatic groups.

30. The crosslinking agent of claim 28, wherein the compound (C) comprises a compound selected from benzoin, hydroxycyclohexyl phenyl ketone and mixtures thereof.

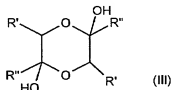
5 31. The crosslinking agent of claim 30, wherein the compound (C) comprises benzoin.

32. The crosslinking agent of claim 30, wherein the compound (C) comprises hydroxycyclohexyl phenyl ketone.

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33. The crosslinking agent of claim 28, wherein one or both of R' and R'' are aromatic groups containing at least one heteroatom selected from furyl, pyridyl, methoxy phenyl, and dimethylaminophenyl groups.

15 34. The crosslinking agent of claim 27, wherein the active hydrogen group-containing compound (C) comprises a compound having the following structure (III):



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wherein R' and R'' are the same or different and each independently represents an alkyl group having 1 to 12 carbon atoms or an aromatic group.

35. The crosslinking agent of claim 1, wherein the compound (C) comprises at least one of compound (C) (iii).

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36. The crosslinking agent of claim 1, wherein compound (C) comprises an aliphatic mono-functional alcohol selected from borneol, norborneol, isoborneol, 1-adamantanemethanol, 1-adamantanol, 2-methyl-2-adamantanol and 5-norbornen-2-ol.

37. The crosslinking agent of claim 1, wherein the compound (C) is selected from benzoin, isoborneol, triphenylmethanol, N-tert-butylacrylamide, p-acetophenetidide and mixtures thereof.

38. A crosslinking agent comprising an ungelled reaction product of the following reactants:

(A) at least one aminoplast resin comprising (alkoxyalkyl) aminotriazine having one or less non-alkylated NH bond per triazine ring;

(B) at least one reactive urethane group-containing reaction product of the following reactants: (i) a monoisocyanate selected from cyclohexyl isocyanate, phenyl isocyanate, butyl isocyanate, and mixtures thereof; and (ii) a hydroxyl group-containing polyester polymer having a glass transition temperature of at least 15°C comprising the condensation reaction product of the following reactants:

(1) a cycloaliphatic polyol; and

(2) a cyclic polycarboxylic acid or anhydride; and

(C) at least one compound selected from benzoin, isoborneol, benzyl alcohol, and mixtures thereof,

wherein said crosslinking agent has a glass transition temperature of at least 10°C. and is essentially free of groups which are reactive with aminoplast resin.

39. The crosslinking agent of claim 1, wherein the ratio of total combined moles of the urethane group-containing reaction product (B) and the active

hydrogen-containing compound (C) to moles of aminoplast resin (A) ranges from 1:1.5 to 3.2.

40. A method for preparing a powder crosslinking agent comprising the following steps:

(1) reacting the following reactants:

(a) at least one mono-isocyanate

(b) at least one polyfunctional polymer having functional groups reactive with the mono-isocyanate (a)

in a molar ratio of reactant (b) to reactant (a) ranging from 1: 1.8 to 2.0 to form a urethane group-containing reaction product;

(2) combining the following:

(A) at least one aminoplast resin;

(B) the urethane group-containing reaction product formed in step (1); and

(C) at least one compound different from (B) having active hydrogen groups reactive with aminoplast resin (A), said compound selected from at least one of:

(i) compounds having the following structure (I):



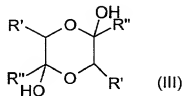
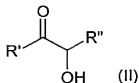
(I)

wherein X is aromatic; R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> can be the same or different and each independently represents H, (cyclo)alkyl having from 1 to 12 carbon atoms, aryl, alkaryl, aralkyl, or an active hydrogen-containing group,

provided that at least one of R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> represents an active hydrogen-containing group which is reactive with the aminoplast resin (A);



(ii) compounds having the following structure (II) or (III):



where R' and R'' are the same or different and each independently represents an aromatic group or an alkyl group having 1 to 12 carbon atoms; and

(iii) compounds different from (i) and (ii) and having a melting point of at least 80°C;

in a ratio of total combined moles of (B) and (C) to moles of aminoplast resin (A) ranging from 1:1.5 to 3.2 to form a reaction admixture; and

(3) heating the reaction admixture formed in step (2) to a temperature ranging from 95°C to 135°C for a time sufficient to form a crosslinking agent having a glass transition temperature of at least 25°C which is essentially free of urethane NH functionality as determined by infrared spectroscopy.

41. The method of claim 40, wherein the aminoplast resin (A) is or is derived from at least one of glycoluril, aminotriazine and benzoguanamine.

42. The method of claim 41, wherein the aminoplast resin (A) comprises alkoxylated aldehyde condensate of glycoluril.

43. The method of claim 42, wherein the aminoplast resin (A) comprises tetramethoxy methylglycoluril.

44. The method of claim 41, wherein the aminoplast resin (A) comprises (alkoxyalkyl) aminotriazine having one or less non-alkylated NH bond per triazine ring.

5 45. The method of claim 44, wherein the aminoplast resin (A) comprises (methoxymethyl) aminotriazine.

46. The method of claim 44, wherein the (alkoxyalkyl) aminotriazine has a degree of polymerization of 1.75 or less.

10 47. The method of claim 40, wherein the polyfunctional polymer (b) is selected from acrylic polymers, polyester polymers, polyether polymers, and mixtures thereof.

15 48. The method of claim 40, wherein the polyfunctional polymer (b) comprises functional groups selected from hydroxyl groups, amine groups, thiol groups, and combinations thereof.

49. The method of claim 40, wherein the polyfunctional polymer (b) 20 comprises a polyester polymer having hydroxyl functional groups.

50. The method of claim 49, wherein the polyester polymer comprises a condensation reaction product of the following reactants:

- 25 (A) a cycloaliphatic polyol; and  
(B) a cyclic polycarboxylic acid or anhydride.

51. The method of claim 50, wherein the cycloaliphatic polyol (A) comprises a diol selected from hydrogenated Bisphenol A, cyclohexane dimethanol and mixtures thereof.

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52. The method of claim 51, wherein the cycloaliphatic polyol (A) comprises hydrogenated Bisphenol A.

53. The method of claim 50, wherein the cyclic polycarboxylic acid (B) is selected from hexahydrophthalic acid, phthalic acid, isophthalic acid, terephthalic acid, anhydrides thereof, and mixtures thereof.

54. The method of claim 53, wherein the cyclic polycarboxylic acid (B) comprises hexahydrophthalic anhydride.

55. The method of claim 50, wherein the number average molecular weight of the polyester polymer ranges from 400 to 1500.

56. The method of claim 50, wherein the hydroxyl value of the polyester polymer ranges from 90 to 180.

57. The method of claim 40, wherein the glass transition temperature of the polyfunctional polymer (b) is at least 15°C.

58. The method of claim 39, wherein the glass transition temperature of the polyfunctional polymer (b) ranges from 40°C to 120°C.

59. The method of claim 40, wherein the mono-isocyanate (a) is selected from cyclohexyl isocyanate, phenyl isocyanate, butyl isocyanate and mixtures thereof.

60. The method of claim 59, wherein the mono-isocyanate (a) comprises cyclohexyl isocyanate.

61. The method of claim 40, wherein the molar ratio of the polyfunctional polymer (b) to the mono-isocyanate (a) ranges from 1:1.8 to 2.0.

62. The method of claim 40, wherein the compound (C) comprises at least one compound having the structure (I).

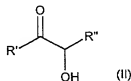
63. The method of claim 62, wherein at least one of  $R^1$ ,  $R^2$ , and  $R^3$  represents a group comprising an active hydrogen-containing group selected from hydroxyl, amide, amine, carboxylic acid, carbamate, urea, thiol and mixtures thereof.

64. The method of claim 63, wherein at least one of  $R^1$ ,  $R^2$ , and  $R^3$  represents a group comprising at least one hydroxyl group.

65. The method of claim 40, wherein compound (C) comprises benzyl alcohol.

66. The method of claim 40, wherein the compound (C) comprises at least one of compound (C)(ii).

67. The method of claim 40, wherein the compound (C) comprises a hydroxyl functional group-containing compound having the following structure (II):



or dimer derivatives thereof, wherein  $R^1$  and  $R^2$  are the same or different and each independently represents an (cyclo)alkyl group having 1 to 12 carbon atoms or an aromatic group.

68. The method of claim 67, wherein one or both of R' and R'' represent aromatic groups.

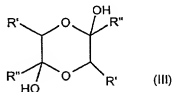
69. The method of claim 67 wherein compound (C) comprises a compound selected from benzoin, hydroxycyclohexyl phenyl ketone and mixtures thereof.

70. The method of claim 69, wherein the compound (C) comprises benzoin.

71. The method of claim 69, wherein the compound (C) comprises hydroxycyclohexyl phenyl ketone.

72. The method of claim 67, wherein one or both of R' and R'' are aromatic groups containing at least one heteroatom selected from furyl, pyridyl, methoxy phenyl, and dimethylaminophenyl groups.

73. The method of claim 66, wherein compound (C) comprises a compound having the following structure (III):



wherein R' and R'' are the same or different and each independently represents an alkyl group having 1 to 12 carbon atoms or an aromatic group.

74. The method of claim 40, wherein the compound (C) comprises at least one of compound (C) (iii).

75. A method for preparing a crosslinking agent comprising the following steps:

(1) reacting the following reactants:

(a) at least one mono-isocyanate selected from cyclohexyl isocyanate, phenyl isocyanate, butyl isocyanate and mixtures thereof, and

(b) at least one hydroxyl group-containing polyester polymer having a glass transition temperature of at least 15°C comprising the condensation reaction product of the following reactants:

(i) a cycloaliphatic polyol; and

(ii) a cyclic polycarboxylic acid or anhydride;

in a molar ratio of reactant (b) to reactant (a) ranging from 1.0: 1.8 to 2.0 to form a urethane group-containing reaction product;

(2) combining the following:

(A) at least one aminoplast resin;

(B) the urethane group-containing reaction product formed in step (1); and

(C) at least one compound selected from benzoin, isoborneol, benzyl alcohol and mixtures thereof, in a ratio of combined moles of (B) and (C) to moles of aminoplast resin (A) ranging from 1.0:1.5 to 3.2 to form a reaction admixture; and

(3) heating the reaction admixture formed in step (2) to a temperature ranging from 95°C to 135°C for a time sufficient to form a crosslinking agent having a glass transition temperature of at least 25°C which is essentially free of urethane NH functionality as determined by infrared spectroscopy.

76. The method of claim 75, wherein the polyester polymer (b) comprises the reaction product of:

(i) a cycloaliphatic polyol selected from hydrogenated Bisphenol A, cyclohexane dimethanol and mixtures thereof; and

(ii) a cyclic polycarboxylic acid selected from hexahydrophthalic acid, phthalic acid, isophthalic acid, terephthalic acid, anhydrides thereof, and mixtures thereof.

77. The method of claim 75, wherein the mono-isocyanate (a) comprises cyclohexyl isocyanate.

78. The method of claim 68, wherein the aminoplast resin (A) comprises (alkoxyalkyl) aminotriazine having one or less non-alkylated NH bond per triazine ring.

79. A curable powder coating composition comprising a solid particulate mixture of the following:

- (1) a film-forming polymer having reactive functional groups,
- (2) a crosslinking agent having functional groups reactive with the functional groups of (1),

said crosslinking agent comprising an ungelled reaction product of the following reactants:

- (A) at least one aminoplast resin;
- (B) a reactive urethane group-containing adduct which is a reaction product of the following reactants:

- (1) at least one mono-isocyanate; and
- (2) at least one polyfunctional polymer having functional groups reactive with the mono-isocyanate (1); and
- (C) at least one compound different from (B) having active hydrogen groups reactive with aminoplast resin (A), said compound selected from at least one of:

- (i) compounds having the following structure (I):



(I)

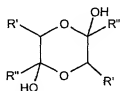
wherein X is aromatic; R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> can be the same or different and each independently represents H, (cyclo)alkyl having from 1 to 12 carbon atoms, aryl, alkaryl, aralkyl, or an active hydrogen-containing group,

provided that at least one of R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> represents an active hydrogen-containing group which is reactive with the aminoplast resin (A);

(ii) compounds having the following structure (II) or (III):



(II)



(III)

where R' and R'' are the same or different and each independently represents an aromatic group or an alkyl group having 1 to 12 carbon atoms; and

(iii) compounds different from (i) and (ii) and having a melting point of at least 80°C;

wherein said crosslinking agent is essentially free of urethane NH functionality and has a glass transition temperature of at least 25°C.

80. The curable powder coating composition of claim 79, wherein the polymer (1) is selected from acrylic, polyester, polyepoxide, polyurethane and polyether polymers and mixtures thereof.



81. The curable powder coating composition of claim 79, wherein the polymer (1) comprises hydroxyl and/or carbamate functional groups.

5 82. The curable powder coating composition of claim 79, wherein the polymer (1) comprises hydroxyl and/or epoxy functional groups.

83. The curable powder coating composition of claim 79, wherein the polymer (1) is present in the composition in an amount ranging from 5 to 90  
10 percent by weight based on total weight of the composition.

84. The curable powder coating composition of claim 79, wherein the polyfunctional polymer (2) comprises a polyester polyol comprising the condensation reaction product of the following reactants:

- 15 (A) a cycloaliphatic polyol; and  
(B) a cyclic polycarboxylic acid or anhydride.

85. The curable powder coating composition of claim 84, wherein the cycloaliphatic polyol (A) is selected from hydrogenated Bisphenol A,  
20 cyclohexane dimethanol, cyclohexane diol and mixtures thereof.

86. The curable powder coating composition of claim 84, wherein the cyclic polycarboxylic acid (B) is selected from hexahydrophthalic acid, isophthalic acid, phthalic acid, terephthalic acid, anhydrides thereof, and mixtures  
25 thereof.

87. The curable powder coating composition of claim 79, wherein the mono-isocyanate (1) is selected from cyclohexyl isocyanate, phenyl isocyanate, butyl isocyanate and mixtures thereof.

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88. The curable powder coating composition of claim 79, wherein the molar ratio of the polyfunctional polymer (2) to the mono-isocyanate (1) ranges from 1:1.8 to 2.0.

5 89. The curable powder coating composition of claim 79, wherein the aminoplast resin (A) is or is derived from at least one of glycoluril, aminotriazine and benzoguanamine.

90. The curable powder coating composition of claim 89, wherein the  
10 aminoplast resin (A) comprises an alkoxylated aldehyde condensate of glycoluril.

91. The curable powder coating composition of claim 90, wherein the  
15 aminoplast resin (A) comprises tetramethoxy methylglycoluril.

92. The curable powder coating composition of claim 89, wherein the  
aminoplast resin (A) comprises (alkoxyalkyl) aminotriazine having one or less  
non-alkylated NH bond per triazine ring.

20 93. The curable powder coating composition of claim 92, wherein the aminoplast resin (A) comprises (methoxymethyl) aminotriazine.

94. The curable powder coating composition of claim 92, wherein the  
(alkoxyalkyl) aminotriazine has a degree of polymerization of 1.75 or less.

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95. The curable powder coating composition of claim 79, wherein the polyfunctional polymer (2) is selected from acrylic polymers, polyester polymers, polyether polymers, and mixtures thereof.

96. The curable powder coating composition of claim 79, wherein the polyfunctional polymer (2) comprises functional groups selected from hydroxyl groups, amine groups, thiol groups, and combinations thereof.
- 5 97. The curable powder coating composition of claim 79, wherein the polyfunctional polymer (2) comprises a polyester polymer having hydroxyl functional groups.
98. The curable powder coating composition of claim 97, wherein the  
10 polyester polymer comprises a condensation reaction product of the following reactants:
- (A) a cycloaliphatic polyol; and
  - (B) a cyclic polycarboxylic acid or anhydride.
- 15 99. The curable powder coating composition of claim 98, wherein the cycloaliphatic polyol (A) comprises a diol selected from hydrogenated Bisphenol A, cyclohexane dimethanol and mixtures thereof.
100. The curable powder coating composition of claim 99, wherein the  
20 cycloaliphatic polyol (A) comprises hydrogenated Bisphenol A.
101. The curable powder coating composition of claim 98, wherein the cyclic polycarboxylic acid (B) is selected from hexahydrophthalic acid, phthalic acid, isophthalic acid, terephthalic acid, anhydrides thereof, and mixtures thereof.
- 25 102. The curable powder coating composition of claim 101, wherein the cyclic polycarboxylic acid (B) comprises hexahydrophthalic anhydride.

103. The curable powder coating composition of claim 98, wherein the number average molecular weight of the polyester polymer ranges from 400 to 1500.

5 104. The curable powder coating composition of claim 98, wherein the hydroxyl value of the polyester polymer ranges from 90 to 180.

105. The curable powder coating composition of claim 79 wherein the glass transition temperature of the polyfunctional polymer (2) is at least 15°C.

106. The curable powder coating composition of claim 79, wherein the glass transition temperature of the polyfunctional polymer (2) ranges from 40°C to 120°C.

15 107. The curable powder coating composition of claim 79, wherein the mono-isocyanate (1) is selected from cyclohexyl isocyanate, phenyl isocyanate, butyl isocyanate and mixtures thereof.

20 108. The curable powder coating composition of claim 107, wherein the mono-isocyanate (1) comprises cyclohexyl isocyanate.

109. The curable powder coating composition of claim 79, wherein the molar ratio of the polyfunctional polymer (2) to the mono-isocyanate (1) ranges from 1:1.8 to 2.0.

25 110. The curable powder coating composition of claim 79, wherein the compound (C) comprises at least one of compound (C)(i).

30 111. The curable powder coating composition of claim 110, wherein at least one of R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> represents a group comprising an active hydrogen-

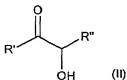
containing group selected from hydroxyl, amide, amine, carboxylic acid, carbamate, urea, thiol, and mixtures thereof.

112. The curable powder coating composition of claim 110, wherein at least one of R<sup>1</sup>, R<sup>2</sup>, and R<sup>3</sup> represents a group comprising at least one hydroxyl group.

113. The curable powder coating composition of claim 110, wherein compound (C) comprises benzyl alcohol.

114. The curable powder coating composition of claim 79, wherein the compound (C) comprises at least one of compound (C)(i).

115. The curable powder coating composition of claim 114, wherein the compound (C) comprises a hydroxyl functional group-containing compound having the following structure (II):



or dimer derivatives thereof, wherein R' and R'' are the same or different and each independently represents an (cyclo)alkyl group having 1 to 12 carbon atoms or an aromatic group.

116. The curable powder coating composition of claim 115, wherein one or both of R' and R'' represent aromatic groups.

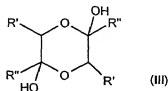
117. The curable powder coating composition of claim 115, wherein compound (C) comprises a compound selected from benzoin, hydroxycyclohexyl phenyl ketone and mixtures thereof.

118. The curable powder coating composition of claim 117, wherein the compound (C) comprises benzoin.

119. The curable powder coating composition of claim 117, wherein the compound (C) comprises hydroxycyclohexyl phenyl ketone.

120. The curable powder coating composition of claim 115, wherein one or both of R' and R'' are aromatic groups containing at least one heteroatom selected from furyl, pyridyl, methoxy phenyl, and dimethylaminophenyl groups.

121. The curable powder coating composition of claim 114, wherein compound (C) comprises a compound having the following structure (III):



wherein R' and R'' are the same or different and each independently represents an alkyl group having 1 to 12 carbon atoms or an aromatic group.

122. The curable powder coating composition of claim 79, wherein the compound (C) comprises a compound selected from isoborneol, triphenylmethanol, N-tert-butylacrylamide, p-acetophenetidine and mixtures thereof.

123. The curable powder coating composition of claim 79, wherein the crosslinking agent (2) is present in an amount ranging from 5 to 95 weight percent based on total weight of the composition.

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124. A multi-layer composite coating comprising a pigmented base coat deposited from a base coat film-forming composition and a transparent top coat over at least a portion of the base coat, said top coat deposited from the curable powder coating composition of claim 79.

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125. A substrate coated with the curable powder coating composition of claim 79.

126. A substrate coated with the multi-layer composite coating of claim 124.

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